

S/N 10/559,513**PATENT****IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant:	Volker Sauermann	Examiner:	Pham, Michael
Serial No.:	10/559,513	Group Art Unit:	2167
Filed:	August 16, 2006	Docket No.:	2003P00256WOUS/0010-017001
Title:	METHOD AND SYSTEM FOR BOOLEAN EXPRESSION QUERY OPTIMIZATION		

PROPOSED AMENDMENTS FOR DISCUSSION – DO NOT ENTER**Proposed Amendments to the Claims**

1. (Currently Amended) A computer implemented method for logically evaluating a Boolean expression used in a query statement, wherein the Boolean expression refers to an attribute and includes a plurality of conditions, comprising:

- receiving the Boolean expression;
- decomposing the Boolean expression into the plurality of conditions;
- for each condition of the plurality, extracting from the condition at least one condition value referring to the attribute, wherein the at least one condition value defines a value range of the condition;
- inserting the at least one condition value in a condition value list in sorted order;
- initializing a relationship vector for the at least one condition value, wherein each component in the relationship vector is a counter and initializing the relationship vector comprises setting the counter for each of the components to an initial value; and
- adjusting the relationship vectors for the at least one condition value and for each further condition value that is in the condition list and that is in the value range of the condition by adjusting the counters, wherein adjusting the relationship vectors comprises:
 - incrementing at least one relationship vector component for the at least one condition value by an increment to reflect the condition; and

propagating the increment through each relationship vector component for each further condition value in the condition list as long as the further condition value is within the value range of the condition.

2. (Previously presented) The method of claim 1, comprising:
reducing the Boolean expression according to each relationship vector.
3. (Previously presented) The method of claim 1, wherein extracting from the condition at least one condition value referring to the attribute comprises:
retrieving a maximum condition value and/or a minimum condition value of the condition.
4. (Previously presented) The method of claim 1, wherein extracting from the condition at least one condition value referring to the attribute comprises:
retrieving an identity condition value of the condition.
5. (Previously Presented) The method of claim 2, wherein initializing the relationship vector comprises:
initializing the relationship vector as including a LESS THAN component, an EQUAL TO component or a GREATER THAN component.
6. (Previously presented) The method of claim 5, wherein initializing the relationship vector comprises:
setting each relationship vector component for the at least one condition value to an initial value if the condition list has no further condition value;
setting each relationship vector component to the LESS THAN component value of the relationship vector for the next greater condition value in the condition value list; or
setting each relationship vector component to the GREATER THAN component value of the relationship vector for the next smaller condition value in the condition value list.

7. (Cancelled).

8. (Currently Amended) The method of claim 1 [[7]], wherein reducing the Boolean expression comprises:

identifying an AND-subset of condition values in the condition value list, where each subset condition value has at least one relationship vector component that has a value equal to the increment multiplied by the number of conditions in the plurality.

9. (Previously presented) The method of claim 8, wherein reducing the Boolean expression further comprises:

composing a reduced Boolean expression based on the AND-subset.

10. (Currently Amended) The method of claim 2 [[7]], wherein reducing the Boolean expression comprises:

identifying an OR-subset of condition values in the condition value list, where each subset condition value has at least one relationship vector component with the initial value.

11. (Previously presented) The method of claim 10, wherein reducing the Boolean expressions further comprises:

composing a reduced Boolean expression based on the OR-subset.

12. (Previously presented) The method of claim 8, further comprising:

if the AND-subset is empty, sending a corresponding notification to a user.

13. (Previously presented) The method of claim 10, further comprising:

if the OR-subset is empty, sending a corresponding notification to a user.

14. (Previously presented) The method of claim 2, wherein reducing the Boolean expression comprises:

composing a reduced Boolean expression, where the reduced Boolean expression comprises a condition that merges at least a first condition and a second condition, the first and second conditions referring to the attribute and representing disjoint intervals, the attribute having no values between the inner interval boundaries of the disjoint intervals.

15. (Currently Amended) A computer-readable storage medium storing [[A]] a computer program product for logically evaluating a Boolean expression used in a query statement, the computer program product being tangibly embodied on a computer-readable storage medium and including executable instructions that, when executed, is configured to cause at least one processor of a computing device to:

receive the Boolean expression;

decompose the Boolean expression into the plurality of conditions;

for each condition of the plurality, extract from the condition at least one condition value referring to the attribute, wherein the at least one condition value defines a value range of the condition;

insert the at least one condition value in a condition value list in sorted order;

initialize a relationship vector for the at least one condition value, wherein each component in the relationship vector is a counter and the instructions that cause the processor to initialize the relationship vector comprises instructions that cause the processor to set the counter for each of the components to an initial value; and

adjust the relationship vectors for the at least one condition value and for each further condition value that is in the condition list and that is in the value range of the condition by adjusting the counters, wherein the instructions that cause the processor to adjust the relationship vectors comprise instructions that cause the processor to:

increment at least one relationship vector component for the at least one condition value by an increment to reflect the condition; and

propagate the increment through each relationship vector component for each further condition value in the condition list as long as the further condition value is within the value range of the condition.

16. (Currently Amended) A computer system for logically evaluating a Boolean expression used in a query statement, wherein the Boolean expressions refers to an attribute and includes a plurality of conditions, comprising:

~~a computing device having~~ a memory to receive the Boolean expression and to store a condition value list; and having at least one processor for executing computer program instructions to:

decompose the Boolean expression into the plurality of conditions;

for each condition of the plurality, extract from the condition at least one condition value referring to the attribute, wherein the at least one condition value defines a value range of the condition;

insert the at least one condition value in the condition value list in sorted order;

initialize a relationship vector for the at least one condition value, wherein each component in the relationship vector is a counter and the instructions that cause the processor to initialize the relationship vector comprises instructions that cause the processor to set the counter for each of the components to an initial value; and

adjust the relationship vectors for the at least one condition value and for each further condition value that is in the condition list and that is in the value range of the condition by adjusting the counters, wherein the computer program instructions causing the at least one processor to adjust comprise:

a first portion to increment at least one relationship vector component for the at least one condition value by an increment to reflect the condition; and

a second portion to propagate the increment through each relationship vector component for each further condition value in the condition list as long as the further condition value is within the value range of the condition.

17. (Previously presented) The computer system of claim 16, wherein the at least one processor further executes computer program instructions to reduce the Boolean expression according to each relationship vector.

18. (Previously presented) The computer system of claim 17, wherein the relationship

vector comprises a LESS THAN component, an EQUAL TO component, and a GREATER THAN component.

19. (Previously presented) The computer system of claim 18, wherein the computer program instructions causing the at least one processor to initialize comprise:

a first portion to set each relationship vector component for the at least one condition value to an initial value if the condition list has no further condition value; and

a second portion to set each relationship vector component to the LESS THAN component value of the relationship vector for the next greater condition value in the condition value list, or to set each relationship vector component to the GREATER THAN component value of the relationship vector for the next smaller condition value in the condition value list.

20. (Cancelled).

21. (Currently Amended) The computer system of claim 16 ~~[[20]]~~, wherein the memory stores an AND-subset of condition values in the condition value list, where each subset condition value has at least one relationship vector component that has a value equal to the increment multiplied by the number of conditions in the plurality.

22. (Previously presented) The computer system of claim 21, wherein the at least one processor executes further computer program instructions to compose a reduced Boolean expression based on the AND-subset.

23. (Currently Amended) The computer system of claim 16 ~~[[20]]~~, wherein the memory stores an OR-subset of condition values in the condition value list, where each subset condition value has at least one relationship vector component with the initial value.

24. (Currently Amended) The computer system of claim 16 ~~[[20]]~~, wherein the memory stores an OR-subset of condition values in the condition value list, where each subset condition value has at least one relationship vector component with a value greater than the initial value.

25. (Previously presented) The computer system of claim 23, wherein the at least one processor executes further computer program instructions to compose a reduced Boolean expression based on the OR-subset.

26. (Previously presented) The computer system of claim 21, where the at least one processor executes further computer program instructions to send a corresponding notification to a user, if the AND-subset is empty.

27. (Previously presented) The computer system of claim 23, where the at least one processor executes further computer program instructions to send a corresponding notification to a user, if the OR-subset is empty.

28. (Previously presented) The computer system of claim 22, where the memory stores a list of all values of the attribute; and the at least one processor executes further computer program instructions to merge at least a first condition and a second condition, the first and second conditions referring to the attribute and representing disjoint intervals, the attribute having no values between the inner interval boundaries of disjoint intervals.

29. (Cancelled).